4.7.2 STORAGE ALTERNATIVE CUMULATIVE IMPACTS

4.7.2.1 Hanford Site

4.7.2.1.1 *Land Resources*

In addition to the storage alternatives, Hanford is being considered as a site for the two other DOE programs identified in Table 4.7.1–1. The total area of undisturbed land that could be affected by these programs during operation is 230 ha (570 acres), or less than 0.2 percent of the total land at Hanford. Site development would be performed in accordance with the land use plans in the *Hanford Site Development Plan*. Proposed development would also be compatible with the industrial use visual character of the developed areas of Hanford. Cumulatively, the actions would consume land, but would be consistent with the land-use plans and visual character of the site.

4.7.2.1.2 *Site Infrastructure*

Some cumulative impacts are possible at Hanford resulting from implementation of any of the storage actions when added to the other two DOE programs identified in Table 4.7.1–1. The site infrastructure cumulative impacts at Hanford that would result from operation of the proposed projects are shown in Table 4.7.2.1.2–1. Hanford has adequate site availability to meet the resource requirements for all of the site infrastructure resources.

Table 4.7.2.1.2–1. Site Infrastructure Cumulative Operation Impacts at Hanford Site

	Electrical		Fuel	
Requirement	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)
No Action	345,500	58	9,334,800	21,039,531
Storage and Disposition[a]	92,000	18	38,000	0
Spent Nuclear Fuel	0	NA	0	0
Waste Management	NA	47	NA	NA
Cumulative Requirement	437,500	123	9,372,800	21,039,531
Site Availability	1,678,700	281	14,775,000	21,039,531

[a] Collocation Alternative.
Note: NA=data was not analyzed in the associated EIS.
Source: DOE 1995o; DOE 1995cc; Table 4.2.1.2–1.

4.7.2.1.3 *Air Quality and Noise*

Cumulative impacts to air quality at Hanford include impacts from the No Action Alternative, the two DOE programs identified in Table 4.7.1–1, and the proposed facilities for each storage alternative. Concentrations are calculated for these emissions and are then compared to Federal and State regulations and guidelines to determine compliance.

Hanford is currently in compliance with the NAAQS as well as State regulations and guidelines. Air emissions attributable to the Storage Alternatives would increase concentrations of criteria pollutants. Potential cumulative impacts are presented in Table 4.7.2.1.3–1. The resulting concentrations from cumulative impacts would be in compliance with Federal and State regulations.

Cumulative noise impacts include contributions from existing and planned facilities plus proposed storage facilities at the site. Noise impacts may result both from onsite noise sources and from offsite sources such as traffic. Noise impacts on individuals from the storage facilities are expected to be small, resulting in little or no

Table 4.7.2.1.3–1. Estimated Cumulative Operational Concentrations of Pollutants at Hanford Site and Comparison With Most Stringent Regulations or Guidelines—No Action and Storage Alternatives

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Other Onsite Activities[b] ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Consolidation ($\mu g/m^3$)	Collocation ($\mu g/m^3$)
Criteria Pollutants							
Carbon monoxide	8-hour	10,000[c]	0.08	0	0.09	0.17	0.17
	1-hour	40,000[c]	0.3	0	0.37	1.04	1.04
Lead	Calendar Quarter	1.5[c]	<0.01	0	<0.01	<0.01	<0.01
	24-hour	0.5[d]	<0.01	0	<0.01	<0.01	<0.01
Nitrogen dioxide	Annual	100[c]	0.03	0.1	0.13	0.14	0.14
Ozone	1-hour	235[c]	e	e	e	e	e
Particulate matter less than or equal to 10 micron in diameter	Annual	50[c]	<0.01	0	<0.01	<0.01	<0.01
	24-hour	150[c]	0.02	0	0.02	0.02	0.02
Sulfur dioxide	Annual	52[c]	<0.01	1.6	1.61	1.61	1.61
	24-hour	260[c]	<0.01	7.3	7.31	7.31	7.31
	3-hour	1,300[c]	0.01	26	26.01	26.01	26.11
	1-hour	1,018[d]	0.02	f	0.02	0.22	0.22
	1-hour	655[d,g]	0.02	f	0.02	0.22	0.22
Mandated by Washington							
Total suspended particulates	Annual	60[d]	<0.01	0	<0.01	<0.01	<0.01
	24-hour	150[d]	0.02	0	0.02	0.02	0.02
Gaseous fluorides	30-day	0.8[d]	h	0	h	h	h
	7-day	1.7[d]	h	0	h	h	h
	24-hour	2.9[d]	h	0	h	h	h
	12-hour	3.7[d]	h	0	h	h	h

Table 4.7.2.1.3–1. Estimated Cumulative Operational Concentrations of Pollutants at Hanford Site and Comparison With Most Stringent Regulations or Guidelines—No Action and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Other Onsite Activities[b] ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Consolidation ($\mu g/m^3$)	Collocation ($\mu g/m^3$)
Hazardous and Other Toxic Compounds							
Ammonia	24-hour	100[d]	<0.01	0	<0.01	<0.01	<0.01
Chlorine	24-hour	5[d]	[h]	0	[h]	<0.01[i]	<0.01[i]
Hydrogen chloride	24-hour	7[d]	[h]	0	[h]	<0.01[i]	<0.01[i]
Hydrazine	Annual	0.0002[d]	[h]	0	[h]	<0.00001[i]	<0.00001[i]
Nitric acid	24-hour	17[d]	[h]	0	[h]	<0.01[i]	<0.01[i]
Phosphoric acid	24-hour	3.3[d]	[h]	0	[h]	<0.01[i]	<0.01[i]
Sulfuric acid	24-hour	3.3[d]	[h]	0	[h]	<0.01[i]	<0.01[i]

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.

[b] Other onsite activities include those associated with the Spent Nuclear Fuel and Waste Management Programs.

[c] Federal and State standard.

[d] State standard or guideline.

[e] Ozone as a criteria pollutant is not directly emitted or monitored by the site. See Section 4.1.3 for a discussion of ozone-related issues.

[f] Not reported.

[g] The standard is not to be exceeded more than twice in any 7 consecutive days.

[h] No sources of this pollutant have been identified.

[i] The concentration represents the alternative contribution and other onsite activities.

Source: 40 CFR 50; DOE 1995o; DOE 1995dd; HF 1995a:1; HF DOE 1996a; Table 4.2.1.3–1.

increase in noise levels at offsite areas. Little or no increase in cumulative noise impacts to individuals offsite is expected to occur.

4.7.2.1.4 *Water Resources*

Table 4.7.2.1.4–1 shows the estimated cumulative water usage from the storage alternatives and the two other DOE programs identified in Table 4.7.1–1. The total cumulative water requirements for the site would be less than 1 percent of the Columbia River's average annual flow (3,360 m^3/s [118,642 ft^3/s]). The proposed storage Collocation Alternative would account for approximately 1 percent of the cumulative water usage. The additional withdrawals are minor in comparison with the average flow of the river and would not noticeably affect the local or regional water supply.

Table 4.7.2.1.4–2 summarizes the estimated cumulative wastewater that would be generated from the storage alternatives and the other two DOE programs. The wastewater from the Storage and Disposition Program would be recycled at newly constructed wastewater treatment facilities. [Text deleted.]

Table 4.7.2.1.4–1. Cumulative Annual Water Usage at Hanford Site

Program	Water Requirements (million l/yr)
No Action	13,706[a]
Storage and Disposition	150[b,c]
[Text deleted.]	
Spent Nuclear Fuel	0[d]
Waste Management	503[a,d]
Total annual cumulative water usage	14,359

[a] Includes both surface and groundwater usage (13,511 million l/yr from surface water and 195 million l/yr from groundwater).
[b] Data represents the maximum value for the comparative alternative scenario.
[c] Data represents the Collocation Alternative.
[d] No additional water resources are required.
Source: DOE 1995o; DOE 1995cc; DOE 1995dd; HF 1995a:1; Table 4.2.1.4–1.

Table 4.7.2.1.4–2. Cumulative Annual Wastewater Discharge at Hanford Site

Program	Nonhazardous Sanitary and Industrial Wastewater (million l/yr)
No Action	246
Storage and Disposition	0[a]
[Text deleted.]	
Spent Nuclear Fuel	0[b]
Waste Management	238[c,d]
Total annual cumulative wastewater	484

[a] Wastewater would be recycled.
[Text deleted.]
[b] Because the ROD resulted in the movement of material away from Hanford, no additional wastewater discharge would result.
[c] Data represents the maximum value for the comparative alternative scenario.
[d] Based on preliminary data.
Source: DOE 1995o; DOE 1995cc; DOE 1995dd; HF 1995a:1; Table 4.2.1.4–1.

4.7.2.1.5 *Geology and Soils*

Cumulative impacts to geologic and soil resources are expected to be minor as a result of the storage alternatives and the other DOE programs identified in Table 4.7.1-1. A total of 230 ha (570 acres) could be disturbed at the site. Soil erosion and storm water control measures would be used during construction to minimize erosion from the disturbed areas. No valuable geologic resources would be affected by any of the planned programs.

4.7.2.1.6 *Biological Resources*

In addition to ongoing activities and the Storage Alternatives, Hanford is being considered for the two other DOE programs identified in Table 4.7.1–1. The total area of undisturbed land that could be affected by these programs is 230 ha (570 acres), or less than 0.2 percent of Hanford. Due to the lack of wetlands and aquatic resources on the site, cumulative impacts to these resources would not be expected. The cumulative loss of habitat could lead to additional impacts to special status species compared to those resulting from construction of a storage facility alone; however, the viability of site populations would not be expected to be jeopardized. Species that could be affected include several State-listed and candidate species such as the ferruginous hawk, loggerhead shrike, western burrowing owl, pygmy rabbit, western sage grouse, sage sparrow, and sage thrasher.

4.7.2.1.7 *Cultural and Paleontological Resources*

The two other DOE programs identified in Table 4.7.1–1 may require ground-disturbing construction, facility modification, and changes in land access at Hanford. Construction at Hanford under these programs is primarily proposed for developed areas which have either been surveyed or are disturbed, and are therefore unlikely to contain cultural or paleontological resources. Prior to construction activity, specific surveys, evaluations, and Native American consultations would be conducted pursuant to NHPA, the *American Indian Religious Freedom Act,* and the *Native American Graves Protection and Repatriation Act*. Each of the Storage Alternatives would be located either within existing buildings or in areas that have already been disturbed. Thus, the cumulative impacts resulting from the storage alternatives, if any, are expected to be minimal.

4.7.2.1.8 *Socioeconomics*

Cumulative impacts to Hanford's regional economy, population, housing, community services, and local transportation would be minor. Overall, adding the other DOE programs identified in Table 4.7.1–1 would confer economic benefits to the region through additional job creation and increased earnings. As shown in Table 4.7.2.1.8–1, the cumulative impact of the programs under consideration at Hanford is not expected to be significant because of the relatively small size of each program. The primary impact beyond providing some stimulus to the regional economy would be to increase traffic flow to and from the site. However, it is not expected that traffic congestion would be significantly increased if one or all of these programs were sited at Hanford.

Table 4.7.2.1.8–1. Socioeconomic Cumulative Impacts at Hanford Site

Program	Direct Employment[a]
Storage and Disposition[b]	572
Spent Nuclear Fuel	0
Waste Management	416
Total	988

[a] Operations.
[b] Collocation Alternative.
Source: DOE 1995o; DOE 1995cc; Section 4.2.1.8.

4.7.2.1.9 *Public and Occupational Health and Safety*

Radiological Impacts. The maximum incremental radiological doses and resulting health effects for the storage alternative, the No Action Alternative, and other actions planned at Hanford are presented in Table 4.7.2.1.9–1. The impacts of these actions have not been summed because the exact locations of the facilities for planned actions may change. In addition, because each of these facilities is sited in a different location, the location of the MEI for each is also different. The MEIs have been selected to maximize the potential dose for a given facility. Since the MEI would have to be resident at more than one location simultaneously in order to receive the maximum dose from each facility, summing the doses would be misleading. The offsite population and total site workforce doses have not been summed because the population distribution and workforce totals as analyzed vary among the actions. [Text deleted.]

Table 4.7.2.1.9–1. Estimated Average Annual Cumulative Radiological Doses and Resulting Health Effects to the Public and Workers From Normal Operation at Hanford Site

	Maximally Exposed Individual Member of the Public		Offsite Population Within 80 km		Total Site Workforce	
Program	Total Dose (mrem)	Fatal Cancer Risk	Total Dose (person-rem)	Number of Fatal Cancers	Total Dose (person-rem)	Number of Fatal Cancers
No Action	5.3×10^{-3}	2.7×10^{-9}	1.6	7.7×10^{-4}	250	0.10
Storage and Disposition[a]	2.5×10^{-6}	1.3×10^{-12}	1.1×10^{-4}	5.5×10^{-8}	25	0.010
[Text deleted.]						
Spent Nuclear Fuel	0.028	1.4×10^{-8}	1.6	8.0×10^{-4}	142	0.057
Waste Management	0.45	2.2×10^{-7}	22	0.011	0.35	1.4×10^{-4}

[a] The impacts from the collocation storage facility are presented since they encompass both Pu and HEU storage.
Source: DOE 1995o; DOE 1995cc; DOE 1995dd; Tables 4.2.1.9–1 and 4.2.1.9–2.

Chemical Impacts. For Hanford, the various NEPA documents use different but otherwise acceptable methodologies to assess the health effects from hazardous chemical exposure for proposed activities. These methodologies may have different indicators for determining the health impact (for example, hazard index, cancer risk, or chemical concentration in the environment). These different indicators prevent a uniform quantitative cumulative impact analysis for this site. However, as indicated in the health impact analysis sections in the NEPA documents for the proposed actions, the health effect from any proposed action at Hanford is predicted to contribute only slightly to the impacts from the baseline activity (No Action). The potential cumulative health impact from hazardous chemicals from implementation of the proposed activities would not exhibit a noticeable increase above the baseline, would be expected to fall within acceptable regulatory limits.

4.7.2.1.10 *Waste Management*

Cumulative impacts to waste management at Hanford could arise from any of the reasonably foreseeable future actions as identified in Table 4.7.2.1.10–1. Waste management activities associated with the storage of Pu and HEU would have consistently smaller impacts than any future environmental restoration and waste management activities at Hanford. Thus, the overall impacts of Pu and HEU storage would not contribute significantly to cumulative impacts. The largest cumulative impacts at Hanford result from the Waste Management PEIS under alternatives where Hanford is selected as a centralized treatment, storage, and/or disposal site, such as the HLW Centralized Alternative, the LLW Centralized Alternative 5, and the Mixed LLW Centralized Alternative. As a result of the ROD from the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Program Final*

Table 4.7.2.1.10–1. Waste Management Cumulative Impacts at Hanford Site (2005)—Annual Volumes

Category	No Action[a] (m^3)	Storage and Disposition[b] (m^3)	Spent Nuclear Fuel[c] (m^3)	Waste Management (m^3)	Total (m^3)
Spent Fuel	0	0	0	0	0
High Level					
Liquid	0	0	0	Included in solid	0
Solid	0	0	0	19,935[d]	19,935
Transuranic					
Liquid	0	0.02	Included in solid	Included in solid	0.02
Solid	271	10	53	675[e]	1,009
Mixed Transuranic					
Liquid	0	0	Included in TRU	Included in TRU	0
Solid	98	4	Included in TRU	Included in TRU	102
Low-Level					
Liquid	0	2.1	1,300	Included in solid	1,302
Solid	3,390	1,300	407	69,600[f]	74,700
Mixed Low-Level					
Liquid	3,760	0.2	Included in solid	Included in solid	3,760
Solid	1,505	66	0.46	9,655[g]	11,230
Hazardous					
Liquid	Included in solid	2	Included in solid	Included in solid	2
Solid	560	2	2	504[h]	1,068
Nonhazardous (Sanitary)					
Liquid	414,000	146,000	NA	NA	560,000
Solid	5,107	1,760	NA	NA	6,870

Table 4.7.2.1.10–1. Waste Management Cumulative Impacts at Hanford Site (2005)—Annual Volumes—Continued

Category	No Action[a] (m^3)	Storage and Disposition[b] (m^3)	Spent Nuclear Fuel [c] (m^3)	Waste Management (m^3)	Total (m^3)
Nonhazardous (Other)					
Liquid	Included in sanitary	Included in sanitary	NA	153,380[i]	153,380
Solid	Included in sanitary	2,200[i]	NA	NA	2,200

[a] No Action volumes are from Table 4.2.1.10–1.

[b] Collocation Alternative annual volume generated from operations, Table E.3.1.3–1.

[Text deleted.]

[c] The Department has decided to implement the preferred alternative, Regionalization by Fuel Type (Alternative 4a) identified in Volume 1 of the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final EIS. According to the amended ROD (61 FR 9441), existing Hanford production reactor spent nuclear fuel will remain at the Hanford Site. Data is from table 3–2, page 350, follow-on NEPA analysis, Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, of Richland, Washington using preferred alternative (dry storage/passivation).

[Text deleted.]

[d] Under the HLW Centralized Alternative, 11,400 m^3 (8,500 canisters) of HLW shipments from INEL, 126,900 m^3 (4,572 canisters) from SRS, and 1,600 m^3 (300 canisters) from West Valley Demonstration Project would be transported to Hanford for storage. Hanford would have 258,800 m^3 (15,000 canisters) of HLW in storage. Annual volume derived by dividing total volume by 20. Acceptance of DOE-managed HLW at the geologic repository is delayed past 2015 (Draft Waste Management PEIS, Vol. I of IV, Table 9.1–1 Page 9-3; Table 9-3-6; Page 9-22).

[e] Under the TRU Waste Centralized Alternative, Hanford would treat 10 percent of the estimated inventory plus 20 year generation of RH-TRU from INEL and LANL (Draft Waste Management PEIS, Vol. I of IV, Table 8.1–1, Page 8-4).

[f] Under the LLW Centralized Alternative 5, Hanford would receive LLW from all sites. The volume was obtained by taking the estimated inventory at Hanford plus the estimated inventory and 20-year generation projection for offsite receipts and dividing by 20 to get annual estimate (Draft Waste Management PEIS, Vol. I of IV, Table 7.1–1, Page 7-3; Table 7.3–14, Page 7-28).

[g] Under the Mixed LLW Centralized Alternative, Hanford would receive mixed LLW from all sites. The volume was obtained by taking the annual estimate the estimated inventory at Hanford plus the estimated inventory and 20-year generation projection for offsite receipts and dividing by 20 to get annual estimate (Draft Waste Management PEIS, Vol. I of IV, Table 6.3–7, Page 6-24; Table 6.1–1, Pages 6-3 and 6-4).

[h] Under the Regionalized Alternative 1, Hanford would treat two-thirds of 50 percent of the received hazardous wastes from LLNL and send the other one-third to a commercial facility. One metric ton of hazardous waste is approximately 1 cubic meter in volume (Draft Waste Management PEIS, Vol. I of IV, Table 10.3–7, Page 10-20).

[i] Represents the total annual incremental wastewater over No Action for all alternatives. Annual volume estimated by assuming 365 days per year (Draft Waste Management PEIS, Vol. II, Tables II-5.1–16 [mixed LLW], page 5–18; II-5.2–12 [LLW], page 5–32; II-5.3–11 [TRU], page 5–45; II-5.4–8 [HLW], page 5–55; and II-5.5–10 [hazardous], page 5–67).

Note: NA=data was not analyzed in the associated EIS.

Source: 61 FR 9441; DOE 1995o; DOE 1995cc; DOE 1995dd; DOE 1996b; Table 4.2.1.10–1.

Environmental Impact Statement, Hanford will not receive spent nuclear fuel from domestic offsite sources, and thus would not contribute significantly to spent nuclear fuel cumulative impacts. However, additional waste volumes would be generated from the storage of existing inventories.